

The Strategic Prevention of Gun Violence Among Gang-Involved Offenders

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Problem-oriented policing has been suggested as a promising way to understand and prevent complex gang violence problems. A number of jurisdictions have been experimenting with new problem-oriented frameworks to understand and respond to gun violence among gang-involved offenders. These interventions are based on the "pulling levers" deterrence strategy that focuses criminal justice and social service attention on a small number of chronically offending gang members responsible for the bulk of urban gun violence problems. As part of the US Department of Justice-sponsored Project Safe Neighborhoods initiative, an interagency task force implemented a pulling levers strategy to prevent gang-related gun violence in Lowell, Massachusetts. Our impact evaluation suggests that the pulling levers strategy was associated with a statistically significant decrease in the monthly number of gun homicide and gun-aggravated assault incidents. A comparative analysis of gun homicide and gun-aggravated assault trends in Lowell relative to other major Massachusetts cities also supports a unique program effect associated with the pulling levers intervention.

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Introduction

Beginning in the late 1980s and continuing through the early 1990s, the United States experienced a dramatic increase in firearms violence (Blumstein, 1995). The gun-violence epidemic was highly concentrated among young minority males, who were often gang-involved and well known to the criminal justice system, residing in disadvantaged inner-city neighborhoods (Braga, 2003; Cook & Laub, 2002). The peak year for gun homicide was 1993, with 17,075 homicides committed with firearms.¹ The increase was followed by a puzzling decrease. By 2000, gun homicide had decreased by almost 41 percent to 10,113 homicides with firearms and has remained low with 10,654 gun homicides in 2004. Criminologists and public policy analysts examined a wide range of factors—innovative policing strategies, a strong economy, higher imprisonment rates, stronger gun control, and stabilizing street-level drug markets—that may have been associated with the drop (Blumstein & Wallman, 2000). In 2005, for the first time in 5 years, the Federal Bureau of Investigation (FBI) reported an increase in the number of homicides. Nationwide, homicides had increased by 5 percent. In smaller cities, homicides had increased by as much as 12.5 percent.²

In media accounts, academics and practitioners have suggested that these recent increases in homicide are linked to a resurgence of urban gang violence and the availability of firearms (Johnson, 2006; Mansnerus, 2006). Conflicts among street gangs have long been noted to fuel much of the violence in US cities. City-level studies have found gang-related motives in more than one third of homicides in Chicago (Block & Block, 1993), 50 percent of the homicides in Los Angeles' Hollenbeck area (Tita, Riley, & Greenwood, 2003), and 60 percent of youth homicide in Boston (Kennedy, Piehl, & Braga, 1996). Firearms are usually the weapons of choice in urban gang-violence problems (Klein, 1995). Dealing with gangs and gang-related violence is a challenge for most police departments in the US. In 2003, 96 percent of law-enforcement agencies serving jurisdictions with populations 250,000 and above and 91 percent of those serving a population between 100,000 and 249,999 reported gang problems (Egley, 2005).

Problem-oriented policing has been suggested as a promising way to prevent gang violence (Decker, 2002; Huff, 2002). Problem-oriented policing

1. <http://www.ojp.usdoj.gov/bjs/homicide/tables/weaponstab.htm>

2. In cities with a population of one million residents or more, homicides increased by only 0.5 percent. However, cities between 250,000 and 499,999 residents experienced an increase of 9.4 percent, cities between 100,000 and 249,999 residents experienced an increase of 12.5 percent, and cities between 50,000 and 99,999 residents experienced an increase of 12.4 percent. Data on weapons used in homicide were not released by the FBI in their preliminary report. <http://www.fbi.gov/ucr/2005preliminary/05jan-dec.pdf>

works to identify *why* things are going wrong and to frame responses using a wide variety of often-untraditional approaches (Goldstein, 1979). Using a basic iterative approach of problem identification, analysis, response, assessment, and adjustment of the response, problem-oriented policing has been effective against a wide variety of crime, fear, and order concerns (Braga, 2002; Eck & Spelman, 1987; Goldstein, 1990). This adaptable and dynamic analytic approach provides an appropriate framework to uncover the complex mechanisms at play in gang violence and to develop tailor-made interventions to reduce gang-related victimization. While there are important parallels in gang activity across cities, such as the small number of urban youth who actually participate in gangs (Esbensen & Huizinga, 1993) and the expressive nature of much gang violence (Decker, 1996), the character of criminal and disorderly youth gangs and groups varies widely both within and across cities (Curry, Ball, & Fox, 1994). The problem-oriented approach facilitates understanding of local gangs and associated gang violence so responses can be logically linked to the nature of the problem. As Scott Decker (2003) suggests, one of the crucial factors in responding to gangs is how the problem is understood.

A number of jurisdictions have been experimenting with new problem-oriented frameworks to prevent gang and group-involved violence generally known as the "pulling levers" focused deterrence strategies. These new strategic approaches have shown promising results in the reduction of violence (Braga, Kennedy, & Tita, 2002). Pioneered in Boston to reduce serious gang violence, the pulling levers framework has been applied in many American cities through federally sponsored violence-prevention programs such as the Strategic Alternatives to Community Safety Initiative and Project Safe Neighborhoods (Dalton, 2002). In its simplest form, the approach consists of selecting a particular crime problem, such as youth homicide; convening an interagency working group of law-enforcement practitioners; conducting research to identify key offenders, groups, and behavior patterns; framing a response to offenders and groups of offenders that uses a varied menu of sanctions ("pulling levers") to stop them from continuing their violent behavior; focusing social services and community resources on targeted offenders and groups to match law-enforcement prevention efforts; and directly and repeatedly communicating with offenders to make them understand why they are receiving this special attention (Kennedy, 1997, 2006).

This paper describes the results of a US Department of Justice (DOJ)-funded evaluation of a pulling levers gang violence reduction strategy in Lowell, Massachusetts. Problem analysis research revealed that criminally active gang members, who had ongoing disputes with rival gangs, were central to Lowell's gun violence problem. The pulling levers focused deterrence strategy broadly fit the nature of the violence and was appropriately tailored to the characteristics and dynamics of local gangs and the operational capacities of law-enforcement organizations, social service agencies, and community-based groups in Lowell. Our analyses suggest that the pulling levers strategy was associated with a

significant reduction in serious gun violence in Lowell. The observed reduction was distinct when compared to serious gun violence trends in the State of Massachusetts and its major cities. We begin by reviewing the existing evidence on the violence prevention effects of pulling levers, describe Lowell's experience with the approach, present our analytic framework and results of the impact evaluation, and conclude with a discussion of the key elements of the approach that could be transferred to other cities.

Evidence on the Violence Prevention Value of Pulling Levers Strategies

Nationally, without the support of a formal evaluation, Boston's Operation Ceasefire pulling levers strategy was hailed as an unprecedented success (see, e.g., Butterfield, 1996; Witkin, 1997). These claims followed a surprising large decrease in youth homicide after the strategy was fully implemented in mid-May 1996. However, more rigorous examinations of youth homicide in Boston soon followed. A DOJ-sponsored evaluation of Operation Ceasefire used a quasi-experimental design to analyze trends in serious violence between 1991 and 1998. The evaluation reported that the intervention was associated with a 63 percent decrease in monthly number of Boston youth homicides, a 32 percent decrease in monthly number of shots-fired calls, a 25 percent decrease in monthly number of gun assaults, and, in one high-risk police district given special attention in the evaluation, a 44 percent decrease in monthly number of youth gun assault incidents (Braga, Kennedy, Waring, & Piehl, 2001). The timing of the "optimal break" in the time series was in the summer months after Ceasefire was implemented (Piehl, Cooper, Braga, & Kennedy, 2003). The evaluation also suggested that Boston's significant youth homicide reduction associated with Operation Ceasefire was distinct when compared to youth homicide trends in most major US and New England cities (Braga et al., 2001).

Other researchers, however, have observed that some of the decrease in homicide may have occurred without the Ceasefire intervention in place as violence was decreasing in most major US cities. Fagan's (2002) cursory review of gun homicide in Boston and in other Massachusetts cities suggests a general downward trend in gun violence that existed before Operation Ceasefire was implemented. Levitt (2004) analyzed homicide trends over the course of the 1990s and concluded that the impact of innovative policing strategies, such as Operation Ceasefire in Boston and broken windows policing and Compstat in New York, on homicide was limited. Other factors, such as increases in the number of police, the rising prison population, the waning crack-cocaine epidemic, and the legalization of abortion, can account for nearly the entire national decline in homicide, violent crime, and property crime in the 1990s. Using growth-curve analysis to examine predicted homicide trend data for the 95 largest US cities during the 1990s, Rosenfeld and his colleagues (2005) found some evidence of a sharper youth homicide drop in Boston than elsewhere but

suggest that the small number of youth homicide incidents precludes strong conclusions about program effectiveness based on their statistical models.³ In his examination of youth homicide trends in Boston, Ludwig (2005) suggested that Ceasefire was associated with a large drop in youth homicide but, given the complexities of analyzing city-level homicide trend data, there remained some uncertainty about the extent of Ceasefire's effect on youth violence in Boston.

The National Academies' Panel on Improving Information and Data on Firearms (Wellford, Pepper, & Petrie, 2005) concluded that the Ceasefire evaluation was compelling in associating the intervention with the subsequent decline in youth homicide. However, the Panel also suggested that many complex factors affect youth homicide trends, and it was difficult to specify the exact relationship between the Ceasefire intervention and subsequent changes in youth offending behaviors. While the DOJ-sponsored evaluation controlled for existing violence trends and certain rival causal factors such as changes in the youth population, drug markets, and employment in Boston, there could be complex interaction effects among these factors not measured by the evaluation that could account for some meaningful portion of the decrease. The evaluation was not a randomized, controlled experiment. Therefore, the non-randomized control group research design cannot rule out these internal threats to the conclusion that Ceasefire was the key factor in the youth homicide decline.

The National Academies' Panel also found that the evidence on the effectiveness of the pulling levers focused deterrence strategy in other settings was quite limited (Wellford et al., 2005). The available evidence on the effects of pulling-levers programs in other jurisdictions was scientifically weak. For instance, sudden large decreases in homicide and serious gun violence followed the implementation of pulling levers in Baltimore (Braga, Kennedy, & Tita, 2002), Minneapolis (Kennedy & Braga, 1998), Stockton (CA) (Wakeling, 2003), and High Point (NC) (Coleman, Holton, Olson, Robinson, & Stewart, 1999). Unfortunately, these assessments did not use control groups and relied upon simple pre-post measurements of trends in homicide and gun violence. In East Los Angeles, a DOJ-sponsored replication of Operation Ceasefire experienced noteworthy difficulty keeping the social service and community-based partners involved in the interagency collaboration (Tita et al., 2003). However, the law-enforcement components of the intervention were fully implemented and focused on two gangs engaged in ongoing violent conflict. The quasi-experimental evaluation revealed that the focused enforcement resulted in significant short-term reductions in violent crime and gang crime in targeted areas relative to matched comparison areas (Tita et al., 2003).

Since the publication of the Panel's report, two rigorous evaluations of the effects of pulling levers on serious violence in other jurisdictions have been

3. Berk (2005) raises a number of statistical and methodological concerns with the analysis developed by Rosenfeld and his colleagues.

completed. A quasi-experimental evaluation of the Indianapolis Violence Reduction Partnership found that the pulling levers strategy was associated with a 42 percent reduction in homicide in Indianapolis (McGarrell, Chermak, Wilson, & Corsaro, 2006). When compared to homicide trends in the nearby cities of Cleveland, Cincinnati, Kansas City, Louisville, and Pittsburgh, the evaluation found that Indianapolis was the only city experiencing a statistically significant decrease in homicide during the study time period. In Chicago, a quasi-experimental evaluation of a PSN gun violence reduction strategy found significant reductions in homicides in treatment neighborhoods relative to control neighborhoods (Papachristos, Meares, & Fagan, 2007). The evaluation found that the largest effect was associated with preventive tactics based on the pulling levers strategy, such as offender notification meetings that stress individual deterrence, normative change in offender behavior, and increasing views on legitimacy and procedural justice.

As demonstrated by the various policy dilemmas raised by subsequent replications of the 1984 Minneapolis Domestic Violence Experiment (Sherman, 1992), criminal justice interventions can have varying effects among different populations and in different settings. Most social scientists agree that caution should be used in drawing strong policy conclusions from a single study, no matter how well designed (Manski, 2003; Weisburd & Eck, 2004). While the pulling levers strategy has not yet been evaluated using the "gold standard" randomized controlled experimental design, four quasi-experiments and four simple assessments have found violence-prevention effects associated with the approach. This evidence provides an empirical basis for further program development, research, and evaluation (Welsh & Farrington, 2001). The current study represents a replication and extension of the seminal Operation Ceasefire evaluation—the application of the pulling levers strategy to control violent conflicts among Hispanic and Asian gangs in a much smaller city. The question of whether crime reductions are the result of pulling levers strategies or other national trends will eventually be answered by additional research in new settings which attempts to control for other potential crime-reduction causes. This study attempts to contribute to this line of research.

Strategic Prevention of Gang Violence in Lowell, Massachusetts

Lowell is a small city located about 30 miles northeast of Boston and has a geographic expanse of 14.5 square miles. According to the 2000 US Census, Lowell had 105,167 residents that were 68.6 percent White, 16.5 percent Asian, 4.2 percent Black, and 10.7 percent mixed or other race. Fourteen percent of Lowell residents considered themselves Hispanic. The median annual income of Lowell residents was \$39,192, and the median home value was \$134,200. This was well below the Massachusetts median annual income of \$50,502 and median home value of \$185,700. Like most urban centers, a small proportion of Lowell

residents lived in poverty. 13.6 percent of Lowell residents live below the poverty level as defined by the US Census Bureau. While only 11.1 percent of Lowell households were female-headed with children under 18 years of age, 32.3 percent of these families lived below the poverty level. Among the 275 law-enforcement agencies in jurisdictions between 100,000 and 249,999 residents that reported to the Uniform Crime Reports program in 2000, Lowell ranked 67th with a violent-crime rate of 768.3 per 100,000 residents (<http://bjsdata.ojp.usdoj.gov/dataonline/>).

The DOJ-sponsored Project Safe Neighborhoods (PSN) initiative provides an important opportunity for police departments to understand and respond to gang-violence problems. PSN is an attempt to reduce gun crime by bringing together a broad array of existing local programs that target gun crime and providing those programs with additional tools necessary to be successful (<http://www.psn.gov>). Lowell was one of 11 target cities in the US Attorney's District of Massachusetts selected for PSN attention. Beginning in April 2002, the PSN coordinator, former Assistant US Attorney Marianne Hinkle, worked with members of the Lowell Police Department (LPD) to develop an interagency task force to focus law-enforcement resources on violent gang members believed to be central to gun violence problems in the city. Key members of the PSN Task Force included the LPD, Middlesex County prosecutors, Federal prosecutors, Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) agents, Federal Bureau of Investigation (FBI) agents, probation officers, parole officers, and Department of Youth Services ("DYS" or juvenile corrections in Massachusetts) caseworkers. PSN gun-violence prevention strategies were developed using a problem-oriented policing framework. Researchers from Harvard University and Northeastern University worked closely with criminal justice practitioners in Lowell to assess the nature of their homicide and serious nonfatal gun violence problem and develop appropriate interventions (Braga et al., 2006). Preliminary findings from the problem analysis work were available to the working group in August, and, based on the early results of the analysis, the PSN gang violence reduction strategy was fully implemented by October 2002 (Braga et al., 2006; LaFleur, 2002).

Gun Violence and Gangs in Lowell

Gun homicide, fortunately, is a rare event in Lowell. Lowell did not have any gun homicides in 1999, two gun homicides in 2000, and two gun homicides in 2001. By the end of 2002, Lowell had experienced six gun homicides. As in most American cities, aggravated assaults involving firearms are much more common. Figure 1 presents the aggregate yearly number of gun homicides and gun-aggravated assaults in Lowell between 1996 and 2005. During this time period, there were 23 gun homicides and 557 gun-aggravated assault incidents. Between 1996 and 2002, Lowell averaged 63.1 incidents of serious assaultive gun violence per year. After the implementation of the PSN strategy, serious assaultive gun

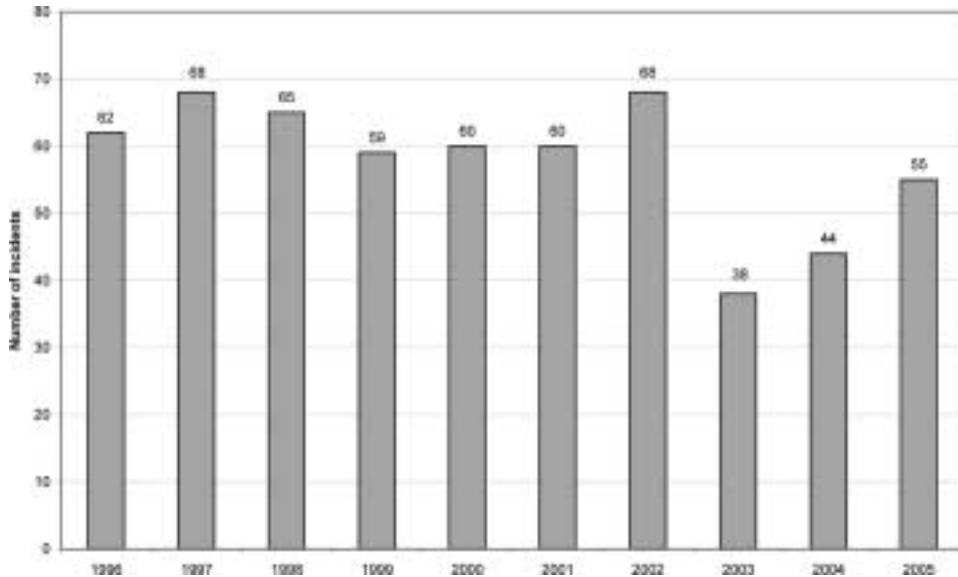


Figure 1 Gun homicides and gun assaults in Lowell, Massachusetts, 1996-2005.

violence dropped to 38 total incidents in 2003 and remained low at 44 total incidents in 2004. Like many smaller US cities in 2005, Lowell experienced a 25 percent increase in assaultive gun violence with 55 total incidents. Since 2003, Lowell has averaged 45.7 incidents per year. When compared to the pre-PSN yearly mean of 63.1 incidents, there were 27.6 percent fewer serious assaultive gun violence incidents in Lowell.

The problem analysis closely examined all homicide incidents between 2000 and 2002 and all aggravated assaults involving firearms in 2002 (see Braga et al., 2006 for a complete description). The criminal histories of Lowell homicide and gun-aggravated assault offenders and victims were characterized by a wide range of offenses—or “cafeteria-style” offending, as Malcolm Klein (1995) terms it in his research on gang offending patterns. The research found that some 95 percent of homicide offenders, 82 percent of gun-aggravated assault offenders, 47 percent of homicide victims, and 29 percent of aggravated gun assault victims were arraigned at least once in Massachusetts courts before they committed their crime or were victimized. Individuals that were previously known to the criminal justice system were involved in a wide variety of offenses and, on average, committed many prior crimes. Lowell homicide and gun violence victims and offenders were arraigned for prior armed violent crimes, unarmed violent crimes, property crimes, drug crimes, non-violent gun crimes (such as illegal gun possession), and disorder offenses. On average, gun-aggravated assault offenders had been arraigned for 12 prior offenses, homicide offenders had been arraigned for nine prior offenses, aggravated gun assault victims had been arraigned for seven prior offenses, and homicide victims had been arraigned for only three prior offenses.

Lowell homicide and gun-aggravated assault offenders and victims also had extensive experience with criminal justice system supervision. For individuals previously known to the criminal justice system, 44 percent of both homicide offenders and gun-aggravated assault offenders, 39 percent of gun assault victims, and 18 percent of homicide victims were under active probation supervision at the time they committed their crime or were victimized. Before they committed murder, a large majority of homicide offenders previously known to the criminal justice system had been committed to an adult or juvenile corrections facility (94 percent), under prior probation supervision (89 percent), or subjected to a restraining order (22 percent). For gun-aggravated assault offenders previously known to the criminal justice system, 67 percent had been under probation supervision, 56 percent had been subjected to a restraining order, and 44 percent had been committed to an adult or juvenile corrections facility. For homicide victims previously known to the criminal justice system, 36 percent had been under probation supervision, 18 percent had been subjected to a restraining order, and 27 percent had been committed to an adult or juvenile corrections facility.

A working group of LPD detectives and gang unit officers was convened to review the circumstances of the homicide and gun-aggravated assault incidents.⁴ Using the crime incident review method (see Klofas & Hipple, 2006), the research team found that 71 percent of the homicides and 35 percent of the aggravated gun assault incidents had circumstances that involved gang-related motives. Beyond the circumstances of the incident, gang members were identified as the offenders in 46 percent of the gun-aggravated assaults and 74 percent of the homicides. At a later date, the same group identified 19 active street gangs in Lowell with between 650 and 750 members representing about 4 percent of Lowell youth between the ages of 15 and 24 and less than 1 percent of Lowell's total population.⁵ Clearly, a small number

4. Law enforcement agencies in different cities use different definitions for gang-related crime (Maxson & Klein, 1990). For example, Los Angeles police define crime as gang-related when gang members participate, regardless of motive. Chicago police use a more restrictive definition and classify homicides as gang related only if there is a gang motive evident. For our purposes, drawing on gang research conducted in Boston, homicides and aggravated gun assault incidents were considered connected to gang activity if (a) the offender or the victim (but not necessarily both) was a gang member and (b) the motivation behind the violent event was known or believed to be connected to gang activity (Kennedy, Braga, & Piehl, 1997). Thus, the killing or assault of a gang member by another gang member in a dispute over contested turf would be considered gang-related; the killing or assault of a non-gang innocent bystander during the same dispute would be considered gang-related; the killing or assault of a gang member by a non-gang member during a robbery attempt or a domestic dispute would not be considered gang-related (see Braga et al., 2006).

5. From the outset, we recognized that defining the term *gang* is a very complex issue (Ball & Curry, 1995). Although criminal justice practitioners in Lowell use the word "gang," it was mostly a term of convenience, meaning in practice "a self identified group of youth who act corporately (at least sometimes) and violently (at least sometimes)." Thus, what "gang" means in Lowell bears little resemblance to what it means, for instance, in Chicago or Los Angeles. While the definition of gang used in this exercise was well within the bounds of standard police and academic practice, it was used here as a placeholder conveying no additional information about the nature of gangs in Lowell (Braga et al., 2006).

of gang-involved individuals generated a disproportionate amount of serious violence in Lowell.

The problem analysis research also revealed that most gang conflicts were personal and vendetta-like. While some gang disputes involved drug business and money issues, the bulk of gang violence involved a cycle of retaliation between groups with a history of antagonisms. Conflicts among Lowell gangs fall into two broad categories: Asian gang disputes and Hispanic gang disputes (Braga et al., 2006). Gang rivalries generally did not cross these ethnic lines. Conflicts among Asian gangs were among clusters of Bloods and Crips gangs composed mostly of Laotian and Cambodian youth. The central Asian gang conflict involved a fierce dispute between the Tiny Rascals Gang (grey rag) and Asian Boyz subsets of the Crips and the Dangerous Little Bloods and Moonlight Strangers subsets of the Bloods. Conflicts among Hispanic gangs mainly involved a very violent rivalry between the Latin Lords and the Latin Kings. The Latin Kings also had an emergent dispute with a small mixed-race gang called Dynasty that involved street-level sales of marijuana. Even among gangs, the use of serious violence was not equally distributed. The analysis concluded that less than one-half of Lowell gangs were responsible for the vast majority of the gang-related violence in the City.

Implementing Pulling Levers

The Lowell's PSN gang violence reduction strategy borrowed heavily from Boston's Operation Ceasefire intervention. The Boston story was well known to the members of the Lowell PSN Task Force. At first blush, the pulling levers strategy seemed to be an appropriate approach to dealing with a serious gun violence problem that was highly concentrated among a small number of gang-involved chronic offenders engaged in ongoing disputes. An interagency partnership, comprising criminal justice organizations, social service agencies, and community-based groups, focused prevention, intervention, and enforcement activities on gang members involved in violent conflicts. The partnership developed from Lowell's "Safety First" initiative that focused the same organizations on domestic violence and juvenile crime issues beginning in 1996 (see Hartmann, 2002). The new task for the partnership was to focus its combined powers tightly on the small number of gangs and gang members who generated the bulk of Lowell's serious violence problem. The PSN Task Force managed the pulling levers strategy with assistance from city-employed streetworkers (social service providers that worked on the street instead of in an office) from the United Teen Equality Center (UTEC), representatives from YMCA/YWCA and Big Brother/Big Sisters programs, and selected community-based groups, such as the Cambodian Mutual Assistance Association.

The Task Force initially engaged a "traditional" pulling levers focused deterrence strategy that involved deterring violent behavior by chronic gang offenders by reaching out directly to gangs, saying explicitly that violence would no

longer be tolerated, and backing that message by “pulling every lever” legally available when violence occurred (Kennedy, 1997). Lowell gangs were not subjected to increased law-enforcement attention arbitrarily, nor did the working group develop a “hit list” of gangs. Rather, enforcement actions by the Task Force were triggered by outbreaks of gang violence. As was the case in Boston, Lowell gangs selected themselves for focused law-enforcement attention by engaging in violence. When gang violence occurred, Task Force members and their social service and community-based partners sent a direct message to violent gang members that they were “under the microscope” because of their violent behavior. Police officers, probation officers, and DYS caseworkers immediately flooded the targeted gang’s turf and communicated to gang members that their presence was due to the violence. Streetworkers walked the streets and explained that they wanted the violence to stop and supported the efforts of their law-enforcement counterparts to cease the violence. Streetworkers also made offers of services and opportunities to gang members.

As operations focused on particular gangs unfolded, members of the Task Force continually reassessed the enforcement levers available to cease violent gang activity. Enforcement responses were tailored to particular gangs and often included a wide range of actions such as probation checks, changes in community supervision conditions, serving outstanding arrest warrants, special prosecutorial attention to crimes committed by violent gang members, increased disorder enforcement, and the disruption of street-level drug markets. Building on the Boston experience, the basic premise of Lowell’s application of pulling levers was to take advantage of the chronic-offending behaviors of gang members. It was important to recognize that gang members were vulnerable to a variety of criminal justice sanctions and that targeted enforcement actions could be used to good effect in controlling their violent behavior. The enforcement actions were only as harsh as necessary to stop a particular gang from engaging in violence. For many gang members, heightened levels of police, probation, and DYS enforcement were sufficient to end the violence. For certain hardcore gang members, it was necessary to involve the enhanced enforcement capabilities of the Federal authorities to stop the violence.

The PSN Task Force focused Federal enforcement efforts on “impact players,” or individuals who were particularly dangerous and served as “carriers” of criminal ideas across social networks and whose presence in particular groups facilitated violent action.⁶ The criminal justice practitioners felt strongly that within violent gangs, there were a very small number of particularly dangerous youth that did not want social intervention and that needed to be removed

6. During this time period, press releases on key prosecutions by the USAO included: “Lowell Man Sentenced to Five Years in Federal Prison for Cocaine Trafficking” (October 25, 2002), “Seven Lowell Individuals Arrested on Drug Distribution Charges” (July 8, 2003), “Twenty Members of the Almighty Latin King/Queen Nation Named in Federal and State Charges” (February 24, 2004), and “Five Arrested in Lowell on Federal Gun and Drug Charges” (August 22, 2005).

from the street to protect themselves and other youth from their violent behavior. They believed that identifying and incarcerating these impact players would produce greater crime-prevention benefits by focusing scarce law-enforcement resources on highly active gang members who spread ideas or facilitated violent action. The identification process was largely based on subjective street intelligence gathered by law-enforcement officials interacting closely with gang members.

While enforcement actions were carried out, the members of the Task Force continued communications with violent gang members (Braga et al., 2006). A direct and explicit message was delivered to violent gangs that violent behavior would no longer be tolerated and that the interagency group would use whatever means were legally available to stop the violence. This message was communicated to other gangs not engaged in violence so they would understand what was happening to the violent gang and why it was happening. Streetworkers and many community members voiced their support of the law-enforcement actions and asked the youth to stop the violence, while streetworkers reiterated their offers of services and opportunities. In addition to talking directly to gang members on the street, the deterrence message was delivered through a variety of communication strategies including handing out PSN business cards and fliers, a toll-free phone line, public service announcements on television and radio stations, bus placards, and strategically placed public service billboards (Noonan, 2003).⁷ The City of Lowell also held a series of gang summit meetings involving law-enforcement agencies, social service providers, community leaders, and gang-involved youth (Minch, 2005; Scott, 2003).

Preventing Serious Violence Among Asian Gangs

The Task Force felt very confident about their ability to prevent violence among Hispanic gangs by pursuing a general pulling levers strategy. However, the Lowell authorities felt much less confident about their ability to prevent Asian gang violence by applying the same set of criminal justice levers to Asian gang members. As Malcolm Klein (1995) suggests, Asian gangs have some key differences from typical Black, Hispanic, and White street gangs. They are more organized, have identifiable leaders, and are far more secretive. They also tend to be far less territorial and less openly visible. Therefore, their street presence is low compared to other ethnic gangs. Relationships

7. In partnership with the nonprofit organization Stop Handgun Violence (<http://www.stophandgun-violence.com/>), the USAO implemented these strategies in several cities in the District of Massachusetts. The media campaigns also publicized a toll-free phone line (1.877.333.GUNS) that provided information on federal and state sentences for gun crimes, voice mail to leave anonymous tips on gun-related crimes, and contact information for social services. The phone line had an option for Lowell services which included contact information for UTEC, the Boys and Girls Club, and the Cambodian Mutual Assistance Association.

between law-enforcement agencies and the Asian community are often characterized by mistrust and a lack of communication (Chin, 1996). As such, it is often difficult for the police to develop information on the participants in violent acts to hold offenders accountable for their actions. In Lowell at this time, the LPD had little reliable intelligence about Asian gangs in the city. The LPD had attempted to develop informants in the past, but most of these efforts had been unsuccessful. With the increased focus on Asian gang violence, the LPD increased its efforts to develop intelligence about the structure of the city's Asian gangs and particularly the relationship between Asian gang violence and ongoing gambling that was being run by local Asian businesses.

Asian street gangs are sometimes connected to adult criminal organizations and assist older criminals in extortion activities and protecting illegal gambling enterprises (Chin, 1996). In many East Asian cultures, rituals and protocols guiding social interactions are well defined and reinforced through a variety of highly developed feelings of obligation, many of which are hierarchical in nature (Zhang, 2002). This facilitates some control over the behavior of younger Asian gang members by elders in the gang. In Lowell, Cambodian and Laotian gangs comprised youth whose street activities were influenced by "elders" of the gang. Elders were generally long-time gang members in their 30s and 40s that no longer engaged in illegal activities on the street or participated in street-level violence with rival youth. Rather, these older gang members were heavily involved in running illegal gambling dens and informal casinos that were operated out of cafes, video stores, and warehouses located in the poor Asian neighborhoods of Lowell. The elders used young street gang members to protect their business interests and to collect any unpaid gambling debts. Illegal gaming was a very lucrative business that was much more important to the elders than any ongoing beefs the youth in their gang had with other youth. In contrast to acquiring information on individuals responsible for gun crimes in Asian communities, it was much easier to detect the presence of gambling operations through surveillance or a simple visit to the suspected business establishment.

The importance of illegal gaming to influential members of Asian street gangs provided a potentially potent lever to law enforcement in preventing violence. The authorities in Lowell believed that they could systematically prevent street violence among gangs by targeting the gambling interests of older members. When a street gang was violent, the LPD targeted the gambling businesses run by the older members of the gang. The enforcement activities ranged from serving a search warrant on the business that houses the illegal enterprise and making arrests to simply placing a patrol car in front of the suspected gambling location to deter gamblers from entering. The LPD coupled these tactics with the delivery of a clear message, "when the gang kids associated with you act violently, we will shut down your gambling business. When violence erupts, no one makes money." Between October 2002 and June 2003, the height of the focused attention on Asian gangs, the LPD

conducted some 30 search warrants on illegal gambling dens that resulted in more than 100 gambling-related arrests.⁸

While this approach to preventing violence among Asian street gangs represents an innovation in policing, it is not an entirely new idea. The social control exerted by older Asian criminals over their younger counterparts is well documented in the literature on Asian crime. For example, in his study of Chinese gangs in New York City, Ko-Lin Chin (1996) suggests that gang leaders exert influence over subordinate gang members to end violent confrontations so they can focus their energies on illegal enterprises that make money. The prospect of controlling street violence by cracking down on the interests of organized crime is also familiar to law enforcement. In his classic study of an Italian street gang in Boston's North End, Whyte (1943) describes the activities of beat officers in dealing with outbreaks of violence by cracking down on the gambling rackets run by organized crime in the neighborhood. Nevertheless, the systematic application of this approach, coupled with a communications campaign, represents an innovative way to deal with Asian street gang violence.

Impact Evaluation

Like most evaluations of crime-prevention programs (Ekblom & Pease, 1995), our evaluation design departs from the desirable randomized controlled experimental approach. The PSN strategy was aimed at all areas of Lowell with a serious gun-violence problem. There were no control areas (or control gangs) set aside within the city because of the following: (1) the aim was to do something about gun violence wherever it presented itself in the city; (2) the target of the intervention was defined as the self-sustaining cycle of violence in which all gangs were caught up and to which all gangs contributed; and (3) the communications strategy was explicitly intended to affect the behavior of gangs and individuals not directly subjected to enforcement attention. Therefore, it was not possible to compare areas and groups affected by the strategy to similar areas and groups not affected. Our analysis of impacts within Lowell associated with the PSN intervention follows a basic one-group time series design (Campbell & Stanley 1966; Cook & Campbell 1979); we also use a non-randomized quasi-experiment to compare youth homicide trends in Lowell to gun violence trends in other Massachusetts cities (Cook & Campbell 1979; Rossi & Freeman 1993).

8. After this period of heightened attention, violent disputes among Asian gangs abated, and the PSN Task Force focused on conflicts among Hispanic gangs and the removal impact players from the streets of Lowell. Beginning in January 2005, the actions of the PSN Task Force waned when former AUSA Marianne Hinkle was appointed a judge in the Dedham District Court of Massachusetts (<http://www.bostonbar.org/pp/shns020705.htm>). The US Attorney District of Massachusetts did not appoint another PSN Coordinator until late summer 2005. During this time period, the PSN Task Force did not meet regularly, and the interagency focus on violent gangs diminished.

Within-Lowell Outcome Measure: Gun Homicide and Gun-Aggravated Assault Incidents

Since gun homicides are rare events in Lowell, we aggregated monthly counts of gun homicides and gun-aggravated assault incidents into one outcome variable measuring the overall monthly count of assaultive gun-violence incidents.⁹ As such, the key outcome variable in our assessment of the impact of the PSN intervention was the citywide monthly number of gun homicide and gun-aggravated assault incidents in Lowell between January 1, 1996 and December 31, 2005. It is well known that police incident data, such as the FBI's Uniform Crime Reports, have shortcomings. For instance, crime incident data are biased by the absence of crimes not reported by citizens to the police and by police decisions not to record all crimes reported by citizens (see Black, 1970). Although incident reports have flaws, careful analyses of these data can yield useful insights on crime (Schneider & Wiersema, 1990). Moreover, official police incident data are widely used for assessing trends and patterns of gun crime (Blumstein, 1995; Cook & Laub, 2002) and the evaluation of gun violence reduction programs (see, e.g., Cohen & Ludwig, 2003; McGarrell, Chermak, Weiss, & Wilson, 2001; Sherman & Rogan, 1995),

The gun homicide and gun-aggravated assault data used in these analyses were provided by the LPD Crime Analysis Unit.¹⁰ While citywide "shots fired" calls for service were examined during the problem analysis phase of the PSN process (Braga et al., 2006), these data were not suitable for an extended analysis of gun violence trends in Lowell for two reasons: (1) computerized calls for service data were not available pre-2000 and (2) the LPD upgraded to a new Computer-Aided Dispatch system in 2004. Any noteworthy changes in shot-fired calls after the implementation of the intervention could have been influenced by the improved reporting capabilities of the upgraded system.

9. Standard FBI Uniform Crime Reports definitions were used to define gun homicide and gun-aggravated assault incidents. Gun homicides were criminal homicide incidents committed with a firearm. As defined by the FBI, criminal homicides involve "the willful (nonnegligent) killing of one human being by another. As a general rule, any death caused by injuries received in a fight, argument, quarrel, assault, or commission of a crime is classified as Murder and Nonnegligent Manslaughter" (p. 15). According to the FBI, an aggravated assault is "an unlawful attack by one person upon another for the purpose of inflicting severe or aggravated bodily injury. This type of assault usually is accompanied by the use of a weapon or by means likely to produce death or great bodily harm. ... the category Aggravated Assault-Firearm includes all assaults in which a firearm of any type is used or is threatened to be used. Assaults with revolvers, automatic pistols, shotguns, zip guns, rifles, etc. are included in this category" (pp. 23-24). See <http://www.fbi.gov/ucr/handbook/ucrhandbook04.pdf>

10. Gun homicide and gun-aggravated assault data were available from a computerized database maintained by the LPD Crime Analysis Unit for the years 2000 through 2005. Unfortunately, the weapons used in aggravated assaults were not in computerized records between 1996 and 1999. For this time period, we reviewed archived copies of the incident reports and determined which aggravated assault incidents involved firearms.

Simple Pre/Post Comparisons

In these analyses, we selected October 2002 as the official start date of the PSN intervention, since all elements—the focus on impact players, a special inter-agency response to Asian and Hispanic gang violence, and the communications campaign with gangs—were in place as of that date (Braga et al., 2006; LaFleur, 2002). No other rival programs were implemented in Lowell even roughly close to this time period (McDevitt et al., 2006). Figure 2 presents the monthly count of Lowell gun homicide and gun-aggravated assault incidents between January 1996 and December 2005. After the implementation of the PSN strategy, the mean monthly count of gun homicides and gun assault incidents decreased by 27.8 percent, from a pre-test monthly mean of 5.4 incidents to a post-test monthly mean of 3.9 incidents. This simple analysis suggests that the PSN intervention was associated with a noteworthy reduction in assaultive gun violence in Lowell.

Multivariate Analyses

As Figure 2 suggests, monthly counts of gun homicide and gun-aggravated assault incidents in Lowell were distributed in the form of rare event counts. There are well-documented problems associated with treating event count variables, which are discrete, as continuous realizations of a normal data-generating process (King, 1989). As such, methods such as standard mean difference tests

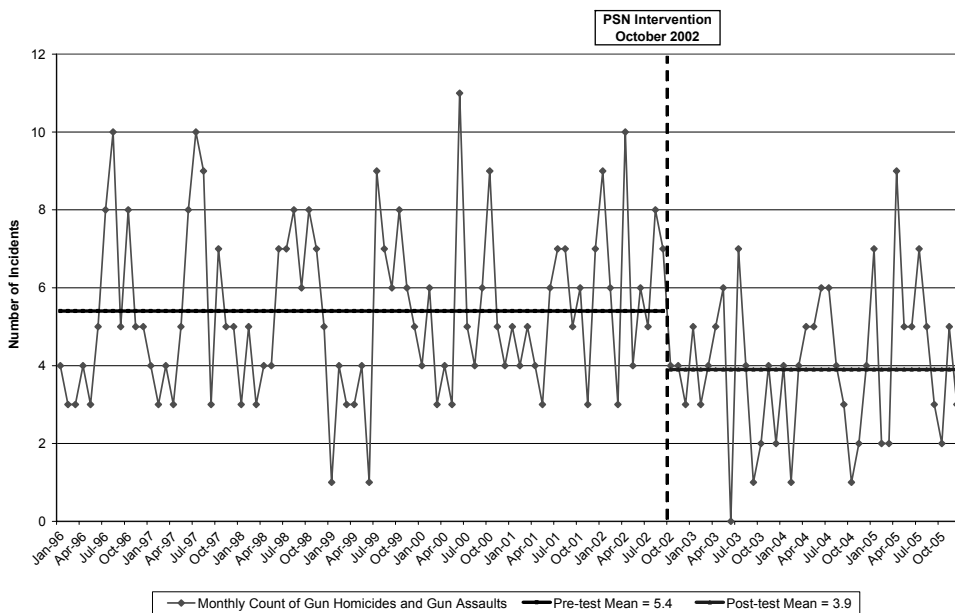


Figure 2 Monthly count of Lowell gun-homicide and gun-assault incidents, 1996-2005.

and ordinary least squares regression that assume population normality of the dependent variable should not be used to analyze count data (Gardner, Mulvey, & Shaw, 1995). Rather, Poisson regression is generally used to estimate models of the event counts (Long, 1997). The Poisson regression model has the defining characteristic that the conditional mean of the outcome is equal to the conditional variance. However, in practice, the conditional variance often exceeds the conditional mean (Long, 1997). When a sample count distribution exhibits this "overdispersion," it is unlikely that a Poisson process generated it. Assuming a Poisson process, when the true process generates overdispersed data, results in the same coefficient estimates but underestimates coefficient variances. This results in spuriously large test statistics on the hypothesis that the true coefficient is equal to zero in the population (Gardner et al., 1995).

When count data are overdispersed, it is appropriate to use the negative binomial generalization of the Poisson regression model. The negative binomial regression model is an extension of the Poisson regression model that allows the conditional variance of the dependent variable to exceed the conditional mean through the estimation of a dispersion parameter (Long, 1997). Using the Kolmogorov-Smirnov goodness-of-fit test, the outcome variable distribution was not found to be significantly different from a Poisson process (Kolmogorov-Smirnov $Z = .411$, $p = .996$). Therefore, we can conclude that the distribution of monthly gun violence events was not overdispersed.

In addition to determining the nature of the outcome variable distribution, there are three sources of noise in any time series which could obscure intervention effects: *trend*—the series could drift upwards or downwards; *seasonality*—the series could spike at different times (e.g., gun violence increases in summer months); and *random error*—even if the series was de-trended and de-seasonalized, observations would fluctuate randomly around some mean level (McDowall, McCleary, Meidinger, & Hay, 1980). If a time-series model does not account for these sources of error, the intervention analysis will be confounded. To account for trends in the time series, we included a simple trend variable for linear trends and a trend-squared variable for curvilinear trends.¹¹ In order to account for seasonal effects in our model, we included dummy variables for each month.

To identify whether there was a serial autocorrelation component, we analyzed the pre-intervention time series. We used Auto Regressive Integrated Moving Average (ARIMA) models to detect whether the monthly counts of gun violence events were serially autocorrelated (i.e., the number of events made in January 1996 was significantly correlated with the number of events in February

11. The trend variable was simply the month number from the start to the end of the time series (i.e., for the January 1996 through December 2005 series, the trend variable ranged from 1 to 120). The trend-squared variable was calculated by taking the square of the trend variable.

1996, and so on) (McDowall et al., 1980).¹² The pre-intervention time series data did not show significant serial autocorrelation; therefore we did not estimate an AR(1) autoregressive component in our model.¹³ We also included covariates to control for any changes in the monthly counts of assaultive gun violence that could be associated with changes in Lowell's population size or existing secular violent crime rate trends. A binary dummy variable indicating whether the PSN intervention was present or not was constructed to estimate the effects of the intervention on the monthly counts of assaultive gun violence.

The parameters for the independent variables were expressed as incidence rate ratios (i.e., exponentiated coefficients). Incidence rate ratios are interpreted as the rate at which things occur; for example, an incidence rate ratio of 0.90 would suggest that, controlling for other independent variables, the selected independent variable was associated with a 10 percent decrease in the rate at which the dependent variable occurs. To ensure that the coefficient variances were robust to violations of the homoskedastic errors assumption of linear regression models, Huber/White/sandwich robust variance estimators were used. Following social science convention, the two-tailed .05 level of significance was selected as the benchmark to reject the null hypothesis of "no difference." STATA 8.2 statistical software was used to analyze the data.

The basic model was as follows:

$$\text{Monthly Count} = \text{Intercept} + \text{Intervention} + \text{Violent} - \text{Crime Rate} + \text{Population} + \text{Trend of Gun Violence} + \text{Trend}^2 + \text{Month Dummy Variables} + \text{Error}$$

Table 1 presents the results of the Poisson regression model. Controlling for the other predictor variables, the PSN intervention was associated with a statistically significant decrease in the monthly number of gun homicides and gun-aggravated assault incidents; according to the incidence rate ratio, the PSN intervention was associated with a 43.1 percent decrease in the monthly number of assaultive gun violence events ($p = .002$). It is important to note that the Poisson Goodness of Fit test resulted in a chi-square test statistic

12. We pursued these analyses to ensure that we were accounting for possible sources of error in our Poisson regression model and did not rely upon ARIMA models to measure intervention effects. Identifying appropriate ARIMA models for evaluation purposes can be a very subjective exercise. As Gary Kleck (1997) suggests, "Experts in ARIMA modeling also commonly point out difficulties that even experienced practitioners have in specifying time series models. Specification is very much an art rather than a science, so that different researchers, using the same body of data, can make substantially different, even arbitrary, and, as a result, obtain sharply different results" (354).

13. Using a variety of ARIMA specifications, we did not detect any statistically significant non-seasonal autocorrelation in the time series data. For example, using an ARIMA (1,1,1)(1,1,1) model, we did not find significant serial autocorrelation: Nonseasonal AR(1) = $-.025$, $t = -.237$, $p = .813$. We also ran an OLS model on the pre-intervention time series (Monthly gun violence counts = constant + trend + trend2 + month dummies + error) and analyzed the residuals using the Durbin-Watson Test (result = 1.965). According to Pindyck and Rubinfeld (1991), the Durbin-Watson Test ranges from 0 to 4. First-order serial correlation does not exist when the Durbin-Watson statistic is close to 2.

Table 1 Results of Poisson regression controlling for linear trends, non-linear trends, seasonal effects, population trends and violent-crime trends

| Variable | IRR | Coefficient | SE | Z | $p > Z $ | 95% confidence interval | |
|--------------|--------|-------------|---------|-------|-----------|-------------------------|---------|
| | | | | | | Lower | Upper |
| Intervention | .5642 | -.5722** | .18917 | -3.03 | 0.002 | -.94305 | -.20149 |
| Population | .9999 | -.0001 | .00003 | -0.89 | 0.372 | -.00008 | .00003 |
| Violent rate | 1.0012 | .0011* | .00049 | 2.38 | 0.018 | .00020 | .00213 |
| Trend | 1.0201 | .0199* | .00863 | 2.31 | 0.021 | .00300 | .03685 |
| Trend-square | .9998 | -.0001 | .00005 | -1.88 | 0.060 | -.00021 | .00004 |
| January | 1.1044 | .0993 | .16244 | 0.61 | 0.541 | -.21908 | .41789 |
| February | .8809 | -.1267 | .13201 | -0.96 | 0.337 | -.38547 | .13201 |
| March | .8029 | -.2194* | .10605 | -2.07 | 0.039 | -.42730 | -.01156 |
| April | 1.194 | .1780 | .16925 | 1.05 | 0.293 | -.15368 | .50976 |
| May | .9763 | -.0239 | .12391 | -0.19 | 0.847 | -.26680 | .21893 |
| June | 1.2688 | .2380 | .16673 | 1.43 | 0.153 | -.08872 | .56485 |
| July | 1.6256 | .4859** | .09916 | 4.90 | 0.000 | .29156 | .68027 |
| August | 1.5001 | .4055** | .09826 | 4.13 | 0.000 | .21296 | .59816 |
| September | 1.0155 | .0154 | .11785 | 0.13 | 0.896 | -.21559 | .24640 |
| October | 1.2971 | .2601 | .13878 | 1.87 | 0.061 | -.01187 | .53215 |
| November | 1.0771 | .0743 | .10506 | 0.71 | 0.479 | -.13155 | .28028 |
| Intercept | - | 2.7214 | 3.09296 | 0.99 | 0.379 | -3.3406 | 8.78359 |

Note. $N = 120$. Wald χ^2 with 16 degrees of freedom = 135.12. Probability of $\chi^2 = 0.0000$. Pseudo- $R^2 = 0.0806$. Log pseudolikelihood = -241.08915. Poisson Goodness of Fit χ^2 with 103 degrees of freedom = 80.60958. Probability of $\chi^2 = 0.9498$. The reference category for the month dummy variable was December.

* $p < .05$; ** $p < .01$.

that was too small to reject the null hypothesis that the observed distribution of the dependent variable was not different from a Poisson distribution (χ^2 with 103 $df = 80.61$, $p = 0.9498$). Controlling for the other covariates, the curvilinear trend and population variables were not statistically significant. However, certain month dummy variables were statistically significant, suggesting seasonal differences in the monthly time series. Monthly counts of assaultive gun violence in Lowell were also positively associated with the simple linear trend variable ($p = .021$) and the citywide violent-crime rate ($p = .018$).

Ideally, the within-Lowell analyses should examine the impact of the PSN strategy on gang-related assaultive gun violence to determine whether the significant decreases were driven primarily by behavioral changes in the target population. Unfortunately, the LPD does not maintain historical records on gang members and does not have any data prior to the PSN problem analysis efforts in 2002 on gang-related gun-aggravated assaults. Therefore, we cannot directly determine whether the observed gun-assault reductions were driven by changes

in violent-gang offending or if these reductions were generated by some other unobserved change in street-violence dynamics.¹⁴

While Lowell does not experience a large number of homicides each year, the LPD maintained detailed records on the population of homicide events during the study time period (since this represents a census of events, the issue of statistical significance is not directly relevant here). A descriptive analysis of the circumstances of homicide incidents suggests a reduction in violent gang offending after the implementation of PSN. Between 1996 and 2002, Lowell experienced 36 total homicides and only nine homicides between 2003 and 2005. The mean number of yearly homicides decreased by 40 percent from a pre-test mean of five homicides per year to a post-test mean of three homicides per year. During the pre-test period, 61.1 percent of the homicides (22 of 36) were generated by gang-related motives. During the post-test period, only 33.3 percent of the homicides (three of nine) were generated by gang-related motives. Gang-related homicides were reduced by 66.6 percent from a mean of 3.1 homicides per year during the 1996-2002 pre-test period to one homicide per year during the 2003-2005 post-test period.

Gun-Aggravated Assault and Gun Homicide Trends in Lowell Relative to Gun-Aggravated Assault and Gun Homicide Trends in Other Cities

Although the within-Lowell analyses support the assertion that a significant reduction in assaultive gun violence was associated with the PSN intervention, it is necessary to determine whether gun-violence trends in Lowell were part of broader statewide trends in gun-aggravated assaults and gun homicides. The following exploratory analyses provide insight on whether Lowell's reduction in assaultive gun violence was part of existing trends in Massachusetts and whether the program impact associated with the PSN intervention was distinct from assaultive gun violence trends in other Massachusetts cities. In order to compare gun violence trends in Lowell to statewide gun violence trends, we analyzed monthly counts of Supplementary Homicide Report (SHR) gun homicide incidents and UCR aggravated assault with firearm incidents for the State of Massachusetts and its largest cities between January 1996 and December 2005.¹⁵

14. As a sensitivity analysis, one of the anonymous reviewers suggested that the Poisson regression model presented in Table 1 should be estimated with only the monthly counts of gun assault incidents. When we estimated this model, our key findings were unchanged. The PSN intervention was still associated with a statistically significant reduction in the monthly count of gun assaults in Lowell (IRR = .5731, coefficient = -.5567, $Z = -2.99$, $p = .003$, Pseudo- $R^2 = .0781$). In future evaluations of PSN interventions, it would be important to distinguish between gang-related and non-gang gun assaults to determine whether pulling levers interventions have spillover effects on non-gang gun violence.

15. For the 1996-2003 time period, the UCR and SHR data for Massachusetts and its cities was obtained through the National Archive of Criminal Justice Data at the Inter-university Consortium for Political and Social Research (http://www.icpsr.umich.edu/NACJD/ucr.html#desc_al). The 2004 and 2005 UCR and SHR data were provided by the Crime Reporting Unit of the Massachusetts State Police.

We initially selected all Massachusetts cities with a population over 60,000. After reviewing the UCR and SHR data, the cities of Cambridge, Framingham, Newton, Quincy, and Somerville were dropped due to very small numbers of gun-aggravated assault and gun-homicide incidents. In addition, the City of Lawrence was not included in the analysis because the Lawrence Police Department did not report any gun-aggravated assault information to the UCR program between 1999 and 2003. The following Massachusetts cities were included in our comparative analysis: Boston, Brockton, Fall River, Lynn, New Bedford, Springfield, and Worcester.¹⁶ Table 2 presents basic demographic, violent-crime rate, and unemployment rate data for Lowell, the seven comparison cities, and the State of Massachusetts. In 2000 (the midpoint of the time series), Lowell had a similar population size to Brockton, Fall River, Lynn, and New Bedford, and was smaller than Boston, Springfield, and Worcester. While Lowell is one of the safer cities, it has population characteristics that are not very different from the other cities. In comparison to the seven selected Massachusetts cities, Lowell was ranked second lowest in violent-crime rate, third lowest (tie with Lynn) in unemployment rate, third lowest in percentage of residents living below the US Census poverty line, and fourth lowest in percentage of non-White residents.

Figure 3 presents the yearly number of gun homicides and gun-aggravated assault incidents in the State of Massachusetts between 1996 and 2005. Like many areas of the United States, the total number of gun-aggravated assaults

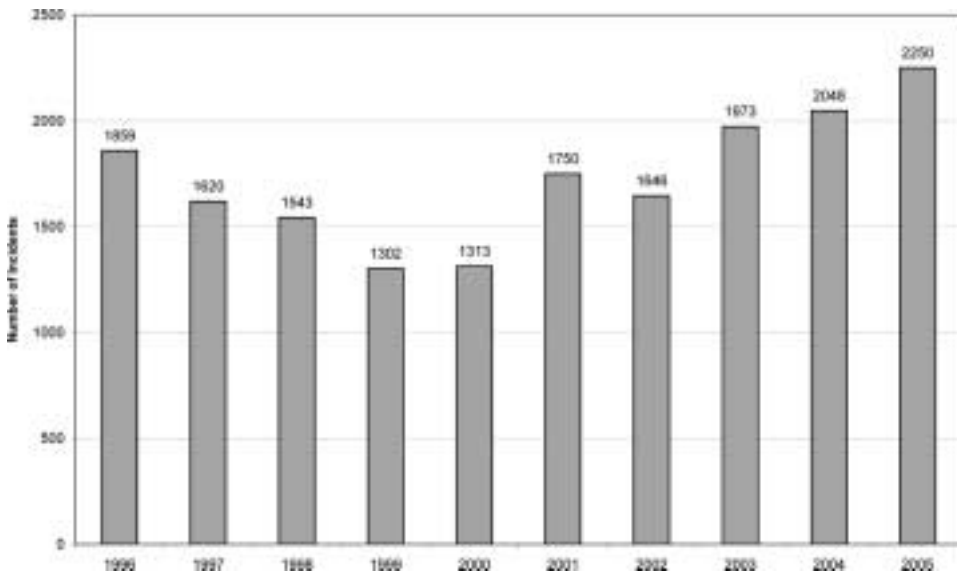


Figure 3 Gun homicide and gun assaults in Massachusetts, 1996-2005.

16. The Brockton Police Department did not report gun assault information to the UCR program in 1999 and 2000. Since there were still almost 5 years of pre-test observations and all the post-test observations, we decided to keep Brockton in our exploratory analysis of gun-violence trends. The time series for the State of Massachusetts and the other selected cities had 120 months of data; Brockton only had 96 months.

Table 2 Demographic, crime, and employment data for eight cities and Massachusetts State used in comparison analyses, 2000

| | Population | Violent-crime rate per 100,000 | Percent non-White | Percent persons below poverty | Unemployment rate |
|---------------|------------|--------------------------------------|----------------------|-------------------------------------|----------------------|
| Boston | 589,141 | 1,242.8 | 45.5 | 19.5 | 3.0 |
| Brockton | 94,304 | 1,056.2 | 38.5 | 14.5 | 3.4 |
| Fall River | 91,938 | 596.1 | 8.8 | 17.1 | 5.1 |
| Lowell | 105,167 | 768.3 | 31.4 | 16.8 | 3.2 |
| Lynn | 89,050 | 1,146.5 | 32.1 | 16.5 | 3.2 |
| New Bedford | 93,768 | 893.7 | 21.1 | 20.2 | 5.5 |
| Springfield | 152,082 | 1,835.2 | 43.9 | 23.1 | 4.1 |
| Worcester | 172,648 | 872.3 | 22.9 | 17.9 | 3.1 |
| Massachusetts | 6,349,097 | 476.1 | 13.0 | 9.5 | 2.7 |

Note. Violent crime data are available from the US Bureau of Justice Statistics (<http://bjsdata.ojp.usdoj.gov/dataonline/>). Population, racial composition, and poverty data are available from the US Census Bureau (<http://quickfacts.census.gov/qfd/states/25000.html>). Unemployment data are available from the Massachusetts Department of Workforce Development (http://lmi2.detma.org/lmi/lmi_lur_a.asp).

and gun homicides in Massachusetts dropped precipitously between 1996 and 1999. The total number of incidents decreased by nearly 30 percent, from 1859 in 1996 to 1302 in 1999. Unfortunately, Massachusetts gun homicides and gun-aggravated assault incidents subsequently increased by 71.4 percent, from 1313 in 2000 to 2250 in 2005. It is important to note that Massachusetts experienced an overall 32.6 percent increase in the yearly mean number of assaultive gun violence incidents between the 1996-2002 period ($M = 1576.1$) and 2003-2005 period ($M = 2090.3$) when Lowell experienced an overall 27.6 percent decrease in the yearly mean number of assaultive gun violence incidents between the 1996-2002 period ($M = 63.1$) and 2003-2005 period ($M = 45.7$).

Of course, statewide trends can mask important variations in city-level assaultive gun violence trends. Recognizing that gun-aggravated assault and gun homicide trends can vary greatly across Massachusetts cities, we specified city-specific regression models that would maximize our ability to control for the various sources of error in the time series of each city and the overall state. Kolmogorov-Smirnov tests and Poisson chi-square tests for goodness of fit were used to analyze the observed distributions of the dependent variables for each city and the overall state in comparison to normal, Poisson, and negative binomial distributions (Kanji, 1993). These analyses suggested that monthly numbers of gun-aggravated assault and gun homicide incidents for the State of Massachusetts, Boston, and Springfield were normally distributed.¹⁷ Kolmogorov-Smirnov

17. We failed to reject the null hypothesis that there is no difference between these distributions and a normal distribution. For Massachusetts, the Kolmogorov-Smirnov test yielded a $Z = .799$ and $p = .546$. For Boston, the Kolmogorov-Smirnov test yielded a $Z = 1.12$ and $p = .163$. For Springfield, the Kolmogorov-Smirnov test yielded a $Z = .914$ and $p = .374$.

tests and Poisson chi-square goodness-of-fit tests revealed that the monthly counts of gun-aggravated assault and gun homicide incidents were distributed as a Poisson process in the Fall River time series and a negative binomial process in the Brockton, Fall River, Lynn, New Bedford, and Worcester time series.¹⁸

Preliminary Poisson, negative binomial, and Ordinary Least Squares regression models included trend and month dummy variables to account for seasonal variations and simple linear and curvilinear trends within each time series. An analysis of the residuals from these preliminary models revealed that the Boston, Springfield, and State of Massachusetts time series had noteworthy AR(1) serial lag-one correlation components.¹⁹ In these situations, maximum likelihood estimation regression models can be used to estimate coefficients when time-series data have first-order autocorrelated errors (Ostrom, 1990). Maximum likelihood linear regression models that included AR(1) autoregressive components were used to analyze the Massachusetts, Boston, and Springfield models. Binary dummy variables indicating whether the Lowell PSN intervention was present or not were included in the models to estimate the trajectory of the monthly counts of assaultive gun violence in each of the time series after Lowell implemented its gun-violence reduction initiative.

Table 3 presents the results of the final Poisson, negative binomial, and maximum likelihood linear regression models controlling for trends and seasonal variations. With the exception of Lowell, other Massachusetts cities experienced varying degrees of increases in the monthly count of gun homicide and gun-aggravated assault incidents after the Lowell PSN intervention commenced in October 2002. Controlling for existing trends and seasonal variations, Boston, Brockton, Fall River, and Worcester experienced non-significant increases in monthly counts of assaultive gun violence after Lowell implemented its PSN intervention. Controlling for existing trends and seasonal variations, Lynn ($p < .01$), New Bedford ($p < .01$), Springfield ($p < .01$), and the State of Massachusetts ($p < .05$) experienced statistically significant increases in monthly counts of assaultive gun violence after Lowell implemented its PSN intervention. In the negative binomial regressions, the results of the Likelihood Ratio Tests (LRT) reject the null hypothesis that the true value of the alpha dispersion parameter was zero; this confirms that the Brockton, Lynn, New Bedford, and Worcester time series were indeed distributed negative binomial. The AR(1) components

18. Kolmogorov-Smirnov tests were initially used to determine that these distributions were significantly different from a normal distribution. A Kolmogorov-Smirnov test revealed that the Fall River time series was not significantly different from a Poisson distribution ($Z = 1.529$). The specification of the appropriate distributions for the remaining count data time series were based on the Poisson goodness-of-fit chi-square tests available after exploratory Poisson regression models were run (controlling for trends and seasonal dummy variables). The tests confirmed negative binomial distributions by rejecting the null hypothesis that there is no difference between the observed distribution and a Poisson distribution for Brockton ($\chi^2 = 141.92$ with $df = 82$, $p = 0.0000$), Lynn ($\chi^2 = 266.26$ with $df = 106$, $p = 0.0000$), New Bedford ($\chi^2 = 194.34$ with $df = 106$, $p = 0.0000$), and Worcester ($\chi^2 = 160.62$ with $df = 106$, $p = 0.0005$).

19. The Durbin-Watson test result was 1.097 for the Massachusetts time series, 1.631 for the Boston time series, and 1.629 for the Springfield time series.

Table 3 Results of Poisson, negative binomial, and maximum likelihood regressions controlling for trends and seasonal effects

| Model | Lowell | Brockton | Fall River | Lynn | New Bedford | Worcester |
|-------------------|----------|----------|-------------|----------|-------------|-----------|
| Post-intervention | Poisson | NB | Poisson | NB | NB | NB |
| SE | -.4126** | .0180 | .1954 | 1.217** | .9374** | .1551 |
| Z | .1247 | .1395 | .1980 | .2925 | .2258 | .1354 |
| $p > t $ | -3.31 | 0.13 | 0.99 | 4.16 | 4.15 | 1.14 |
| Log likelihood | 0.001 | 0.897 | 0.324 | 0.000 | 0.000 | 0.252 |
| α | -242.942 | -260.789 | -241.868 | -273.446 | -263.256 | -309.723 |
| SE | - | .0434** | - | .3207** | .1358** | .0392** |
| LRT | - | .0213 | - | .0856 | .0498 | .0199 |
| p | - | 6.82 | - | 40.63 | 16.24 | 6.00 |
| | - | 0.004 | - | 0.000 | 0.000 | 0.007 |
| Massachusetts | | | | | | |
| Model | ML | Boston | Springfield | | | |
| Post-intervention | ML | ML | ML | | | |
| SE | 29.738* | .794 | 10.692** | | | |
| t | 14.299 | 5.332 | 3.560 | | | |
| $p > t $ | 2.080 | 0.149 | 3.003 | | | |
| Log likelihood | 0.040 | 0.882 | 0.003 | | | |
| AR (1) | -521.115 | -427.378 | -422.538 | | | |
| SE | .612** | .477** | .193* | | | |
| t | .076 | .085 | .096 | | | |
| $p > t $ | 8.069 | 5.590 | 2.008 | | | |
| | 0.000 | 0.000 | 0.047 | | | |

Note. $N = 120$ for all models except Brockton ($N = 96$). Covariates for all regressions included trend and month dummy variables. Alpha is the dispersion parameter calculated for negative binomial regression models. The results for the Lowell model differ from Table 1 due to the exclusion of violent crime rate and population covariates.

* $p < .05$; ** $p < .01$.

estimated by the maximum likelihood linear regression models were statistically significant for the Boston, Springfield, and State of Massachusetts time series. These analyses suggest that Lowell's significant assaultive gun violence reduction associated with PSN was distinct when compared to assaultive gun violence trends in the State and most major Massachusetts cities.

Discussion

As part of PSN, problem-oriented policing was engaged to address one important problem, serious gun violence, in one city, Lowell. The PSN Task Force assembled a working group with members from a wide variety of agencies and representing a wide variety of law enforcement, social service, and other operational capacities. The treatment was a metamethod known as "problem-oriented policing" which comprised a number of specific operational tactics implemented by an interagency working group to prevent gun violence among gang-involved offenders. Problem-oriented policing is an analytic approach, not a specific set of technologies (see Kennedy & Moore, 1995). Problem-oriented interventions arise from diagnoses of problems, and, depending on the nuances of particular problems, the responses that are developed, even for seemingly similar problems, can be very diverse. The core set of problem-oriented interventions were framed within the "pulling levers" focused deterrence approach. Unfortunately, the PSN research team was not able to collect the necessary pre-test and post-test data to shed light on the specific mechanisms responsible for the observed reduction. The research team was focused on problem analysis and program development and, *a priori*, did not know what form the intervention would take and whom the target audience of that intervention would be. As such, the evaluation was designed to measure the efficacy of the broader pulling levers approach in controlling gun violence and did not attempt to parse out the varying effects of the specific initiatives that were implemented. Future program evaluations should focus on determining which parts of the pulling levers approach serve to decrease violence and which parts were superfluous.

The impact evaluation revealed that the implementation of the pulling levers intervention was associated with a subsequent statistically significant decrease in the monthly count of gun-aggravated assaults and gun homicides in Lowell. Like most small cities in the United States, Lowell experienced a modest increase in gun violence between 2004 and 2005. However, despite this increase, gun-violence counts in 2005 remained lower than gun-violence counts in the pre-test period. The gun violence reduction observed in Lowell during the post-test period was distinct when compared to gun-violence trends in other Massachusetts cities. The State of Massachusetts and its major cities experienced varying increases in monthly counts of gun-aggravated assaults and gun homicides after the pulling levers intervention was implemented in Lowell.

The results of the impact evaluation support the growing body of research that asserts problem-oriented policing can be used to good effect in controlling crime and disorder problems (Braga et al., 1999; Clarke, 1997; Weisburd & Eck, 2004). In particular, the pulling levers intervention suggests a new approach to controlling violent offenders from a more focused application of deterrence principles (Kennedy, 1997). In contrast to broad-based "zero tolerance" policing initiatives that attempt to prevent serious offending by indiscriminately cracking down on minor crimes committed by all offenders, the pulling levers deterrence strategy seeks to control violence by focusing on particular groups that were behaving violently, subjecting them to a range of discretionary criminal justice system action, and directly communicating this message to a very narrow and specific audience. In addition to any increases in certainty, severity, and swiftness of sanctions associated with gun violence, the Lowell PSN strategy sought to gain deterrence through the *advertising* of the law-enforcement strategy, and the personalized nature of its application. It was crucial that gang youth understood the new regime that the city was imposing. In his essay on the misapplication of deterrence principles in gang-suppression programs, Malcolm Klein (1993) suggests that law-enforcement agencies do not generally have the capacity to "eliminate" all gangs in a gang-troubled jurisdiction, nor do they have the capacity to respond in a powerful way to all gang offending in such jurisdictions. Pledges to do so, though common, are simply not credible. The PSN Task Force recognized that, in order for the strategy to be successful, it was crucial to deliver a credible deterrence message to Lowell gangs. Therefore, the PSN intervention targeted those gangs that were engaged in violent behavior rather than expending resources on those who were not.

Beyond deterring violent behavior, the pulling levers strategy was designed to facilitate desired behaviors among Lowell gang members through the strategic provision of social services and the involvement of the community. As Spergel (1995) observes, coordinated strategies that integrate suppression, social intervention, opportunity provision, and community organization are most likely to be effective in dealing with chronic youth gang problems. UTEC street-workers, representatives from the YMCA/YWCA, and others added a much needed social intervention and opportunity provision dimension to the Lowell PSN strategy. With these resources, the PSN Task Force was able to pair criminal justice sanctions, or the promise of sanctions, with help and with services. The availability of social services and opportunities were intended to increase the strategy's preventive power by offering gang members any assistance they may want: counseling, drug treatment, access to education and job training programs, and the like.

The PSN Task Force also consistently sought community involvement in their gang violence reduction efforts. By engaging the community in their violence prevention efforts and creating a sense of joint ownership of the gang violence problem, the Task Force created the political support necessary for both innovation and more focused and aggressive intervention. With their involvement in

the strategy, the community members were more likely to support the approach as a legitimate violence prevention campaign (Braga and Winship, 2006; Winship and Berrien, 1999). Given the potentially harsh law-enforcement levers that can be pulled as part of a focused enforcement program, we feel that community involvement is critical in replicating and sustaining such intensive violence-prevention initiatives. Without the political support of the community, the police cannot pursue an innovative enforcement strategy that targets truly dangerous youth at the heart of urban youth violence problems.

We believe that the research presented here shows that the Lowell PSN initiative was a meaningful problem-oriented policing effort, bringing practitioners and researchers together in new ways, leading to a fresh assessment of the gun-violence problem in Lowell, and leading to operational activities that were a substantial departure from previous practice. The pulling levers intervention was likely responsible for a substantial reduction in gun-aggravated assaults and gun homicides in the city. Given the local nature of the intervention, the effectiveness of the approach in preventing violence may seem unique to Lowell. The PSN strategy was constructed largely from the assets and capacities available in Lowell at the time and deliberately tailored to the city's particular violence problem. Operational capacities of criminal justice agencies in other cities will be different, and gun-violence problems in other cities will have important distinguishing characteristics. However, we believe that the working-group problem-solving process and the "pulling levers" approach to deterring chronic offenders are transferable to other jurisdictions. As described earlier, a number of cities have experimented with these frameworks and have experienced some encouraging violence-prevention results.

The Lowell PSN Task Force applied the basic principles of problem-oriented policing to a substantial public-safety problem. Addressing this problem required the involvement of multiple agencies and the community, as well as substantial investments in analysis, coordination, and implementation. The experience of the Task Force suggests that deploying criminal justice capacities to prevent crime can yield substantial benefits. The problem-solving orientation of the project means that the problem definition, the core participants, and the particulars of the intervention evolved over the course of the collaboration. PSN strategy itself was highly customized to the goals of the collaboration, the particular nature of the gun-violence problem in Lowell, and the particular capacities available in Lowell for incorporation into a strategic intervention. Therefore, the Lowell PSN strategy as such is unlikely to be a highly specifiable, transportable "technology." However, certain process elements of the Lowell PSN Task Force, such as the central role of the line-level working group and the use of both qualitative and quantitative research to "unpack" chosen problems, should be generally applicable to other problem-solving efforts. Using the working group problem-solving approach, criminal justice practitioners in other jurisdictions can develop a set of intervention strategies that fits both the nuances of their gun-violence problem and their

operational capacities. Although the resulting package of interventions may not closely resemble the tactics used in Lowell, the problem-oriented pulling levers frameworks will be similar.

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